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CIS161 Honors Contract
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I. For C++ honors, I have identified two possible topics for investigation. The first involves a parameter study of an aerospace engineering problem. The second is an analysis of three numerical methods for solving ordinary differential equations. I will complete the work outlined for one or both of these topics as time allows. The projects chosen provide interdisciplinary approaches to curriculum covered in class, and therefore are an extension of my C++ coursework. Descriptions of each project follow:

1. Topic one is a parameter study of an aerospace engineering problem. The problem requires the following components:

- Find a solution to the application problem using an analytical method.
- Find a solution to the problem by hand using a numerical method.
- Develop a C++ program to implement the numerical method.
- Validate the program by comparing the program's solution to the solutions from the analytical method and the numerical method solved by hand.
- Perform a parameter study of the application problem by varying the value of a parameter until a certain outcome is reached.
- Create a report detailing the aforementioned components of the project.

2. Topic two covers the analysis of numerical methods for ordinary differential equations. I will compare the implementations for three or more numerical methods. Possible methods for comparison include the Euler method, the Heun method, the improved polygon method, the 2nd – 5th order Runge-Kutta methods, or the Runge-Kutta-Fehlberg method. Topic two will include the following components:

- Learn the steps and theory of the method.
- Develop a program to implement the method.
- Verify the program by solving problems with known solutions.
- Apply the method to an application problem.
- Analyze the strengths and weaknesses of the method's implementation.
- Create a report detailing components of the project.

II. Give an oral presentation of either the first or second topic. The reports and oral presentation will include the following:

- An introduction to the problem and numerical method used.
- A brief summary of the results.
- An explanation of the method's theory, how the method works, and the required equations.
- A C++ implementation of the method.
- Solutions to known problems.
- Solutions to application problems.
- A project summary.

III. Evaluation criteria for Calculus II honors project consists of two parts:

- Project reports will be worth 75%.
 - The reports will be evaluated on: format, content, grammar, timeliness, and accuracy of mathematical operations.
- Oral presentation will be worth 25%.
 - The presentation will be evaluated on: organization, presentation, timeliness, and accuracy of mathematical operations.